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TARGET ACQUISITION AND ANALYSIS TRAINING SYSTEM:
COMPARISON OF TWO TRAINING MEDIA USING THE BASIC COMBAT VEHICLE
IDENTIFICATION (CVI) TRAINING PROGRAM

Nigel R. Nicholson, Norman D. Smith, and Otto H. Heuckeroth
Army Research Institute

ARI Field Unit at Fort Hood, Texas
George M. Gividen, Chief

SYSTEMS RESEARCH LABORATORY
Robin L. Keesee, Director

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The Basic Combat Vehicle Identification (CVI) Training Program (GTA 17-2-9) currently in use by the Army is an effective training program, which uses the Kodak Carousel 35 mm slide projector system, a system available to the lowest-echelon Army unit. The system has many disadvantages, however, and these motivated research to develop and test an alternative system using audio filmstrips.

Soldiers were trained on both the filmstrip and the slide systems. The result was that soldiers identified significantly more combat vehicles after one

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20. Abstract (continued)

training period with the filmstrip system than after one training period with
the slide system. After a second training period, soldiers who received the
filmstrip first and the slide system second showed no significant performance
change, but the soldiers who saw the slide system first and then saw the film-
strip showed a significant improvement in performance.

User evaluation by all ranks (E1 to E6) after training on each system
resulted in the audio filmstrip being rated significantly higher than the
slide system for ease of instructor use (e.g. mobility, classroom set-up, and
instructor preparation), and in terms of pupil satisfaction. Soldiers rated
the filmstrip system higher than the slide system by a significant margin when
stating which medium they would prefer for future training.

TARGET ACQUISITION AND TRAINING SYSTEM:
COMPARISON OF TWO TRAINING MEDIA FOR THE BASIC COMBAT VEHICLE
IDENTIFICATION (CVI) TRAINING PROGRAM

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TARGET ACQUISITION AND ANALYSIS TRAINING SYSTEM (TAATS): COMPARISON OF TWO TRAINING MEDIA USING THE BASIC COMBAT VEHICLE IDENTIFICATION (CVI) TRAINING PROGRAM

EXECUTIVE SUMMARY

Requirement:

The Target Acquisition and Analysis Training System (TAATS) research program was designed to develop a series of training programs in combat vehicle recognition and identification (R&I). The impetus for such a system was provided by a series of requests dating from 1975 from both Training and Doctrine Command (TRADOC) and Forces Command (FORSCOM). In 1980, an integrated series of training programs was planned in conjunction with the Army's proponent for vehicle recognition at the Combined Arms Center (CAC), Fort Leavenworth, Kansas. The first of the training programs was the Basic Combat Vehicle Identification (CVI) Training Program, which was produced in 1981. The Army adopted CVI that year as its standard R&I training program.

A 35mm Kodak Slide Projector System was initially used as the medium for the CVI training program because it was available throughout the Army supply system. Several problems, however, have been reported with the use and maintenance of the CVI Slide System. The ARI Fort Hood Field Unit was, as a consequence, tasked to develop and evaluate an alternative CVI Filmstrip System. This report presents the research results from that evaluation.

Procedure:

Basic Combat Vehicle Identification (CVI) training was given to 114 combat arms soldiers of III Corps, Fort Hood, Texas. Two training conditions were presented. In one condition, 60 men were trained and tested using the Slide System currently in supply Army-wide. On the following day the same men were trained and tested on the prototypic Audio Filmstrip System. In the other condition, 54 men received the same training, but in the reverse order. That is, they were trained and tested first on the prototypic Audio Filmstrip System and then, on the following day, on the current Slide System. After all training and testing was completed, the soldiers rated the two systems.

Findings:

The evaluation found that the prototypic Audio Filmstrip System is a better all around training tool than is the current Slide System. The soldiers who were trained with the Audio Filmstrip System first showed significantly higher identification performance than did the soldiers who were trained with the Slide System first. Furthermore, on the second day of the training period the soldiers who then received Audio Filmstrip System training produced significantly higher identification performance than they had on the Slide System. On the other hand, the soldiers who received Slide System training on the second day showed no significant increase in identification performance over their earlier performance on the Audio Filmstrip System.

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Examination of the questionnaire responses found that soldiers preferred the Audio Filmstrip System over the Slide System both for its ease of use and maintenance, and as a system on which they would prefer to receive other training.

Conclusions:

o   The Audio Filmstrip System trained combat arms soldiers to significantly higher combat vehicle identification performance than did the Slide System.

o   The soldiers who participated in the research rated the Audio Filmstrip System significantly easier to use and maintain than the Slide System.

o   The Junior enlisted soldiers reported that they would prefer to receive future training with the Audio Filmstrip System. Furthermore, the NCOs reported that they would prefer to give future training with the Audio Filmstrip System.

INTRODUCTION

Background:

In 1980, the Target Acquisition and Analysis Training System (TAATS) was established as a component of the research program at the Army Research Institute's Field Unit, Fort Hood, Texas. The major objective of TAATS is to provide a framework within which to develop a series of interrelated target acquisition training programs. Five such programs have been developed, tested and turned over to the Army. They are the Basic Combat Vehicle (CVI) Training Program, the Basic Thermal Combat Vehicle (TCVI) Training Program, the Flash Card Program, the Advanced Combat Vehicle Identification Training Program, and the Combat Vehicle Training Program for the Remotely Piloted Vehicle (RPV). The first three programs, the CVI, TCVI, and the Flash Card Program have been adopted and issued by the Army as standard training devices for vehicle identification as GTA 17-2-9, GTA 17-2-10, and GTA 17-2-11. The Advanced CVI awaits implementation funding. The RPV program was used to train operators during the Developmental Test (DT) II in June 1982 and a final program is now under consideration. Other programs are in development for target acquisition in the areas of air-to-ground training, ground-to-air for low performance aircraft along the battle front, the Bradley ISU, Advanced Thermal CVI, and videodisc/interactive computer applications.

Military Requirement

The 35mm Kodak slide projector system was selected in 1980 as the medium for the CVI and the TCVI Training Programs because it was in the military supply system and was available at the company level Army-wide. Because one of the major objectives of the TAATS is to train the soldier to fight today's battles, the 35mm Kodak system was, at that time, the only acceptable choice.

However, there are disadvantages with the 35mm Kodak system. The major ones include: (1) slides can be removed, lost or malsequenced; (2) slide holders are easily damaged; (3) carousel tray bottoms can misalign, and thus feed slides improperly; (4) the large number of slides (480) distributed in seven carrousel trays makes the total system cumbersome; (5) although instructional materials standardize the training content, instructor skill (usually provided by NCOs) varies greatly.

A cost-effective alternative to the 35mm Kodak slide projector system which does not suffer these problems is needed.

Purpose and Scope of This Research

This research evaluated a prototypic CVI Audio Filmstrip System and compared it with the current 35mm Kodak Slide System projector. Soldiers' training performance scores and subjective ratings formed the basis for assessing each systems' relative usefulness.

METHOD

General Research Description

Two systems--the 35mm Carousel Kodak Slide Projector and the Elmo Audio Filmstrip Projector-- were compared on a CVI training task, using soldiers assigned to combat arms units. Performance scores and subjective ratings were recorded to determine the relative training value of each system.

General Description of the Training Systems

The 35mm Kodak Slide Projection System. A projector (35mm Carrousel Mdl 800 with zoom lens, or the 35mm Carrousel Mdl 850H, usually made by the Kodak Company) is standard equipment in the U.S. Army and is available through the Training and Audiovisual Support Office (TASO) at each military post.

The CVI Training Program consists of 7 carousel slide trays each with a capacity of 80 slides. There are 69 slides in each of six training module slide trays and 60 slides in the seventh test module. An instructor's manual and a slide tray comprise one training module. Also included in the system are an instructor's guide for using the program, a manual including training response and test forms, and a manual describing the final test module.

The CVI Training Program is issued by the TASO in a standard cardboard shipping carton with no special markings. Appendix A displays the CVI Training Program package.

The 35mm Audio Filmstrip Projection System. This system consists of an Elmo Audio Filmstrip Projector, 35-FT(AP), 8 filmstrips, 8 audiotapes, and vehicle name cards enclosed in an aluminum Halliburton carrying case 18" long by 13.5" wide by 6" deep. The projected image is suitable for use on a large screen or on the small 8" x 10" screen located on the underside of the lid of the Elmo Projector. Appendix B displays the Audio Filmstrip System.

Soldiers Trained

The 2d Armored Division, Fort Hood, Texas, supplied 114 soldiers who were assigned to combat arms units. The soldiers were divided into four training groups by the participating military administrators. The composition of the groups by their military occupational specialty (MOS) is presented in Table 1. Assignment was made so that in each group, one-third of the members had a GT of 110 or higher, one-third were between 90 and 109 inclusive, and the final third had 89 or below. An ANOVA over the four training groups showed no significant GT score differences [F (3,109) = 1.23, p = .30]. See Table 2 for group GT means and standard deviations.

Table 1

MOS Distribution in the Four Training Groups

	Group							
	1		2		3		4	
MOS	n	%	n	%	n	%	n	%
11B	5	(20)	1	(3)				
11C			1	(3)				
11M			13	(43)	16	(59)	14	(50)
13B					1	(4)		
13F	7	(28)						
16R	6	(24)						
16S	7	(28)						
19E							1	(4)
19K			9	(30)	10	(37)	13	(46)
63B			2	(7)				
91A			4	(13)				

Table 2

Comparison of GT Categories Across Four Training Groups

		GT								
		≤ 89			90-109			≥ 110		
Group	M	n	SD	M	n	SD	M	n	SD
1	81.00	(5)	4.18	97.33	(15)	6.31	122.20	(5)	8.04
2	83.60	(5)	4.98	100.53	(15)	6.30	116.90	(10)	2.60
3	85.71	(7)	2.06	96.13	(15)	5.99	115.00	(5)	5.15
4	82.00	(6)	3.03	97.75	(12)	5.33	119.70	(10)	9.27

Training Procedure

All four groups received two days of training. On day one, Groups 1 and 2 were trained on the Audio Filmstrip System while Groups 3 and 4 were trained on the Slide System. Both systems included three modules (15 vehicles) from the Basic CVI Training Program. On both days Groups 1 and 3 received training from 0800 to 0950 hours and Groups 2 and 4 from 1000 to 1150 hours. On day two, the groups exchanged training systems and repeated the same three modules.

A description of the system used for their training on each day was presented to the soldiers before training began. After training was completed on each day, a modified Module 7 test (including only vehicles presented in training) was administered. When training and testing were completed on day two, the soldiers were asked to rate both systems.

Data Collection Instruments

The posttraining performance test consisted of 30 images of 15 vehicles (one oblique and one front view). The soldier was required to recognize (state whether the vehicle was a friend or threat) and identify the vehicle (by writing its correct name or number) on the answer form provided to him. He was given 8 seconds of image exposure in which to respond. Finally, a systems evaluation questionnaire asking the soldier to compare the two systems was administered after all training on both media was completed.

Data Analyses

Identification performance differences were examined by analyses of variance[1]. The Chi-square test was employed to evaluate the questionnaire responses.

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[1]The PROC GLM (General Linear Model) from the Statistical Analysis System (SAS) was used to analyze the performance data. Since groups were very nearly balanced in frequency, Type I sums of squares were used.

RESULTS

Analyses were undertaken to answer three questions: (1) Are there significant differences in the performance scores of soldiers who received CVI training provided by the Audio Filmstrip System and the Slide System; (2) Are differences in performance attributable to characteristics of the soldiers (i.e., GT score, rank, and age) and; (3) Do soldiers rate one training system preferable to the other?

Performance on the CVI Audio Filmstrip and Slide Systems

Soldiers in ranks E1-E6 (N=14) were trained and tested with both Audio Filmstrip and Slide Systems. The soldiers were required to give a recognition and identification response to each of the 15 vehicles presented. Because the baseline probability of a correct recognition is .5, only the identification responses have been analyzed and reported in the present study. All partici- pants received training and were tested on each system in separate sessions. The order of presentation was counterbalanced so that approximately half of the soldiers ($\underline{n}$ = 60) received the Slide session first and the others ($\underline{n}$ = 54) received the Audio Filmstrip session first.

Analyses of variance indicated that the order in which the systems were presented had a significant effect on performance when the Slide System [$\underline{F}$ (1, 112) = 33.65, $\underline{p}$ < .0001] was used first but not when the Audio Filmstrip System [$\underline{F}$ (1,112) = 0.21, $\underline{p}$ < .65, n.s.] was used first. Means and standard deviations supporting these analyses are presented in Table 3. These data indicate that performance was enhanced when the participants were subsequently trained on the Audio Filmstrip System. However, performance was not significantly improved by subsequent training on the Slide System.

Table 3

Mean Number of Images Identified on each System by Order of Presentation[a]

($\underline{N}$ = 114)

Order of Presentation	Groups 1 & 2 ($\underline{n}$=54)			Groups 3 & 4 ($\underline{n}$=60)		
		$\underline{M}$[b]	SD		$\underline{M}$[b]	SD
First	Filmstrip	23.21_a	5.96	Slides	16.96_b	7.38
Second	Slides	23.62_a	5.76	Filmstrip	24.17_a	6.12

[a]Maximum possible score is 30 correct.
[b]Means with the same letters were not significantly different on a Duncan's Multiple Range Test.

Chi-square analyses indicated no significant differences among groups on GT category [X^2 (2,n = 101) = 1.34, p = .57, n.s.] or rank [X^2 (1,n = 114) = .82, p = .36, n.s.]. These findings indicate that the performance differences obtained on the Audio Filmstrip and Slide Systems are not due to the influence of either GT or rank.

Soldier Characteristics and Identification Performance

Because performance scores on the two systems differed significantly on the first day of training, separate analyses of variance (ANOVAs) were performed on those data. Since findings from previous studies (e.g., Smith et al., 1980; Shope et al., 1982; Smith et al., 1984), have uncovered a significant relationship between GT and identification performance, it was of interest to examine the contribution of this variable to Slide and Filmstrip performance. As each participant's rank and age were readily available, they were entered into analysis along with the GT scores. Table 4 summarizes the findings of the Statistical Analysis System (SAS) PROC ANOVA[1] results for the Slide sessions; and Table 5 summarizes the findings of the PROC ANOVA results for the filmstrip sessions.

Table 4

Effect of Soldier Characteristics on Slide Identification Performance
(N = 110)

Variable	df	F	p
Age	2	1.29	.28
Rank	2	5.87	.003
GT Score[a]	2	4.57	.01

[a] Four GT scores were missing.

Table 5

Effect of Soldier Characteristsics on Audio Filmstrip Identification Performance
(N = 110)

Variable	df	F	p
Age	2	2.24	.11
Rank	2	7.58	.0009
GT Score[a]	2	1.96	.14

[a] Four GT scores were missing.

[1] Further information on the statistical procedure used in the present study is available in SAS User's Guide: Statistics, (1982). SAS Institute, Cary, NC.

In each analysis, age did not predict performance for Filmstrip or Slide system. GT categories were significant predictors of performance on Slides, but not on Filmstrips. Failure to find a significant relationship between GT and performance on Filmstrips may have been due to the generally higher scores obtained on the Filmstrip System. Occurence of generally high performance scores would contribute to a "ceiling effect" which in turn could preclude detection of performance differences between the GT categories. However, rank was a significant predictor of performance on both systems. A subsequent correlational analysis found that rank correlated positively with performance on both systems (Filmstrip r = .36, p < .0001; Slide r = .31, p < .0008). Thus, it appears that whatever individual characteristics underlie the process by which a soldier earns promotion also facilitate target identification performance.

Soldiers' Ratings of Each System

At the end of all training and testing each soldier completed a systems evaluation questionnaire which measured attitudes toward the two systems on a number of issues. Table 6 presents the mean and standard deviation of scores on each question for both systems, and the statistical significance of the difference between the two means.

Table 6

Mean Ratings on the Systems Evaluation Questionnaire[a]
(N = 114)

Item	Slide		Filmstrip		P
	M	SD	M	SD	
1	2.48	.99	1.67	.74	.0001
2	2.09	.84	1.69	.62	.0001
3	1.87	.89	1.49	.64	.0001
4	1.92	.83	1.65	.66	.0002
5	1.84	.79	1.64	.64	.0017
6	1.73	.80	2.81	1.09	.0001
7	2.23	1.12	2.54	1.12	.0076
8	2.78	1.03	2.59	1.19	.0287
9	2.07	.90	1.74	.73	.0008
10	2.24	1.10	1.71	.97	.0019
11	2.41	1.17	1.65	.95	.0001

[a] For interpretative purposes, note that the questionnaire is keyed 1 (strongly agree) to 5 (strongly disagree). Thus the lower the mean score, the more strongly the participants agreed with the item.

Table 7 presents a more detailed examination of rating differences by soldier rank. NCO (E5 and E6) responses have been reported separately from junior enlisted (E1-E4) responses for those items on which they differed.

Table 7

Soldiers' Ratings of Each System

Neither	Preference		
	Filmstrip	Slides	No Difference
Item 1. "Moving the equipment and training materials from place to place is easy."	E1-E6		
Item 2. "Setting up the classroom is easy."	E1-E6		
Item 3. "The lessons and tests are written so that the training content is easy to present."	E1-E6		
Item 4. "The target image on the screen appears to be real sharp."	E1-E4		E5-E6
Item 5. "The target image on the screen is good and bright."	E1-E4		E5-E6
Item 6. "It is easy to update or change the program."		E1-E6	
Item 7. "A live instructor is the best way to train vehicle recognition."		E1-E6	
Item 8. "A taped (audiotape) instructor is the best way to train vehicle recognition."	E1-E4		E5-E6
Item 9. "Setting up the projector is easy."	E1-E4		E5-E6
Item 10. "If you were taking the training, which method would you like?"	E1-E6		
Item 11. "If you were the instructor giving the training, which method would you like?"	E1-E6		

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DISCUSSION AND CONCLUSIONS

Earlier in this report, maintenance and presentation difficulties with the present 35mm Kodak slide projector version of CVI were noted. It was those deficiencies that led to the development and evaluation of the Audio Filmstrip System.

DISCUSSION

The investigators had anticipated that there would be no significant differences in vehicle identification performance between the training systems. However, as shown in Table 3, soldiers who experienced training with the Slide System on the first day performed significantly worse than those who experienced training with the Audio Filmstrip System on the first day. Furthermore, soldiers who experienced training with the Slide System on the second day performed no better than those who experienced training with the Audio Filmstrip System on the first day.

The performance of those who received Slide System training on the first day of training is comparable to that reported in earlier research (i.e., Smith, Heuckeroth, & Shope, 1985). In both the present study and that of Smith et al., soldiers were trained and evaluated on 30 CVI slides. Consistency of the present Slide System day-one data with the Smith et al. Slide System day-one data supports the inference that these data are reliable. Further, there is no significant difference between the Filmstrip scores of the two groups in the present study. Thus, the significant difference between performance on Filmstrips on day one and Slides on day one would appear to reflect a reliable difference.

One may conclude that the improved Slide System scores of Groups 1 and 2 who initially received Audio Filmstrip System training should not be attributed to mere "practice effect." This can be inferred because no similar "practice effect" was observed on the Audio Filmstrip System scores for Groups 3 and 4 who had received initial training on the Slide System. Thus, it is clear that soldiers who received only one day of training and evaluation with the Audio Filmstrip System out-performed those who received one day of training and evaluation with the Slide System. Furthermore, those soldiers who experienced only one day of training with the Audio Filmstrip System performed no differently from those who had received one day of training with both media.

While the performance differences between media are reliable, our explanations for these differences are speculative. Why did those soldiers who experienced Slide System training on the first day score significantly lower than those who experienced Audio Filmstrip System training on the first day? Moreover, why did Slide System training on the second training day not improve performance over Filmstrip System training on the first training day?

One interpretation of the performance difference is that the Audio Filmstrip System, with taped narration, provided a more engaging activity than did the Slide System with narration read aloud by an instructor. Thus, the soldiers might well have been more highly motivated to produce optimum performance. Previous TAATS research has examined the consequences of

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utilizing several alternate media with which to present CVI training. Smith,
Shope, & Heuckeroth (1985) found that when soldiers were trained with Slides,
Bessler Cue See and videotapes, no significant performance score differences
were found. However, the participating soldiers perceived differences in the
utility of the media, rating videotapes the highest and Bessler Cue See the
lowest. Smith et al. noted that the Bessler Cue See had malfunctioned
frequently, presumably a contributing factor to its low rating. Neither system
evaluated in the present study was reported to have malfunctioned, and thus,
the soldiers' preference for the Audio Filmstrip System may well account for
their having learned to identify significantly more combat vehicles on that
system than on the Slide System. A recent survey of the literature (Babbitt &
Nystrom, 1985) indicates that such situational factors may influence
performance. In light of the preference for the Audio Filmstrip System (See
Table 5) which the soldiers indicated in their responses to the systems
evalulation questionnaire, it appears that motivational factors may indeed
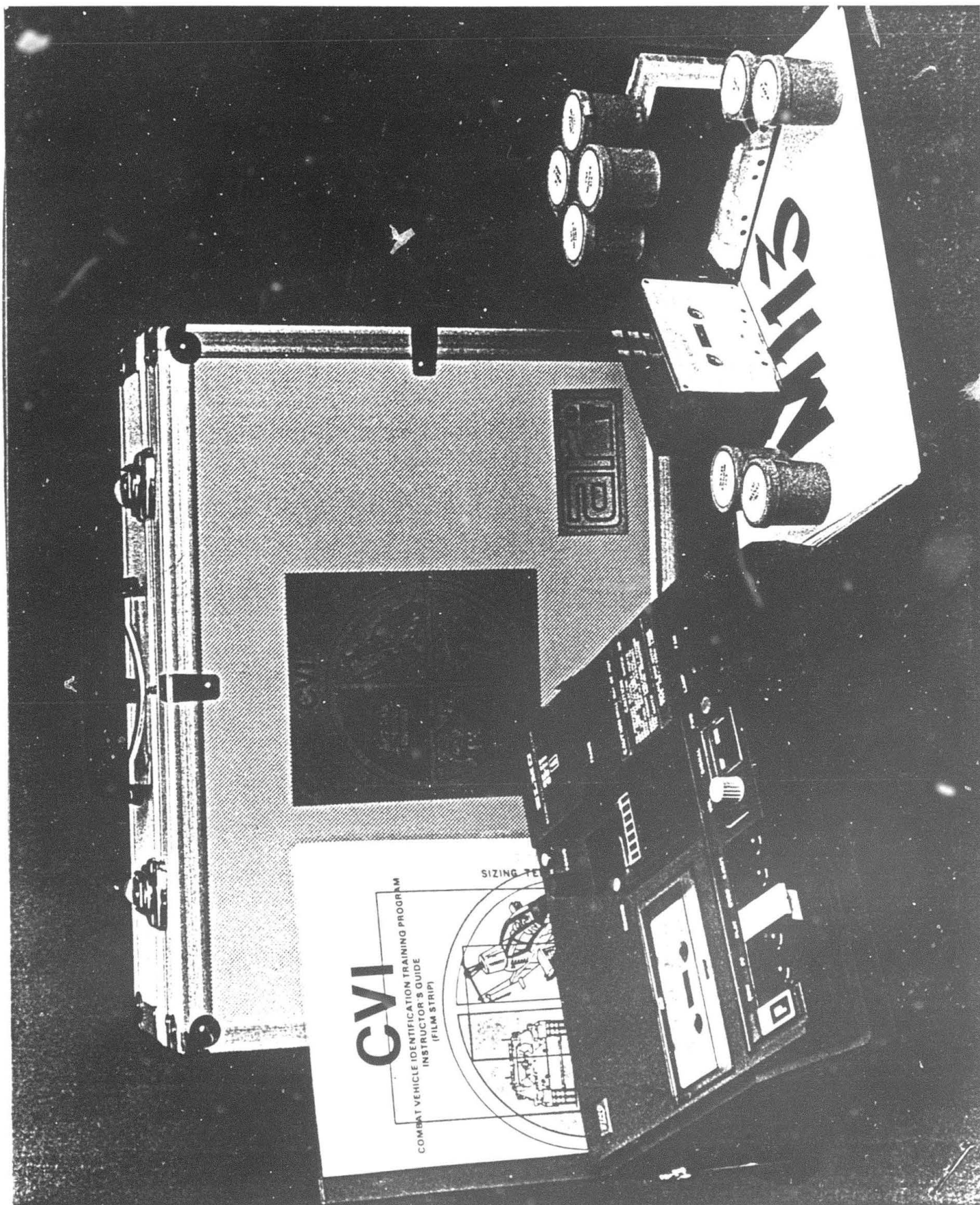account for the observed differences in performance.

Conclusions

o The Audio Filmstrip System trained combat arms soldiers to
   significantly higher combat vehicle identification performance after
   one training period than did the Slide System.

o The soldiers who participated in the evaluation rated the Audio
   Filmstrip System significantly easier to use and maintain than the
   Slide System.

o The junior enlisted soldiers reported that they would prefer to
   receive future training with the Audio Filmstrip System. Furthermore,
   the NCOs reported that they would prefer to give future training with
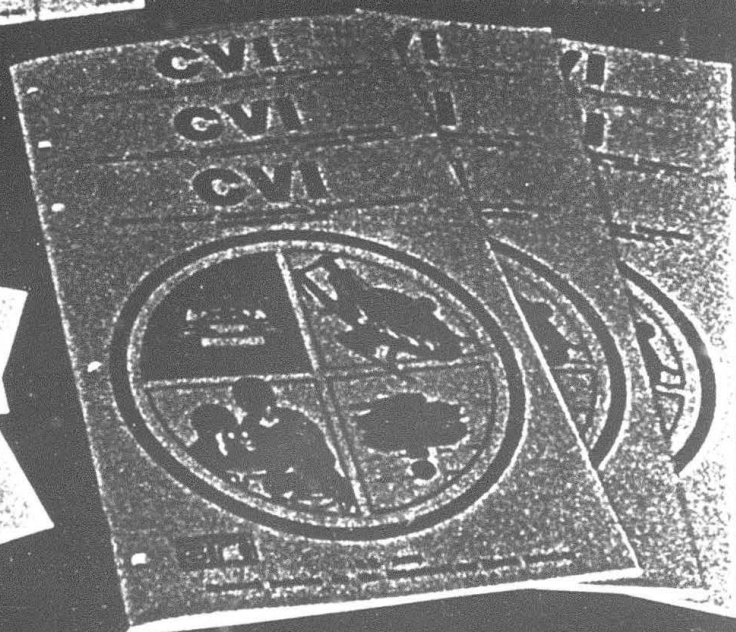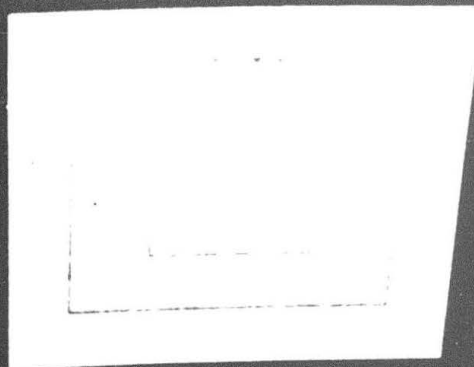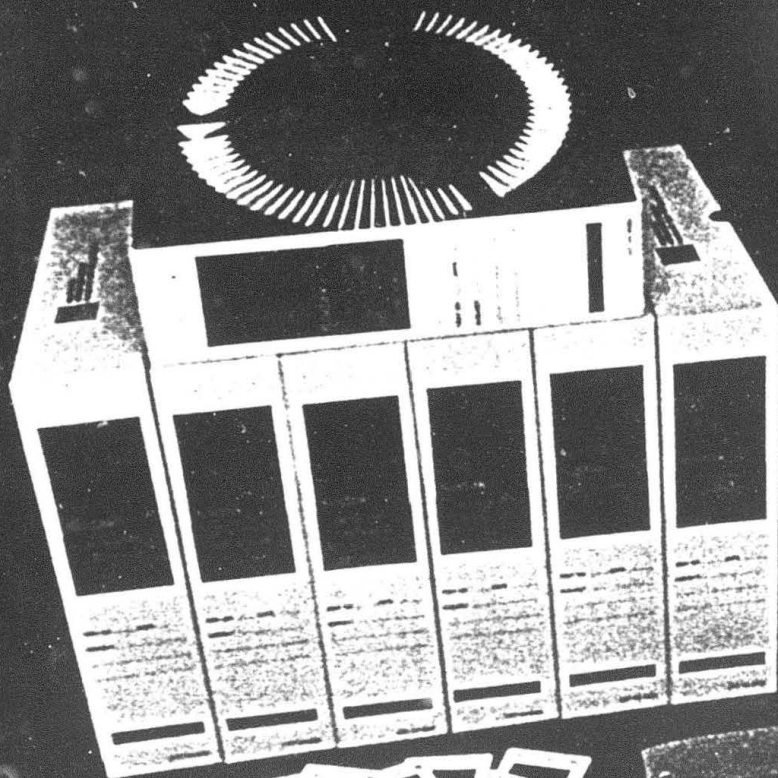   the Audio Filmstrip System.

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CVI
COMBAT VEHICLE IDENTIFICATION TRAINING PROGRAM
INSTRUCTOR'S GUIDE
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